

NAVAL WAR COLLEGE
Newport, R.I.

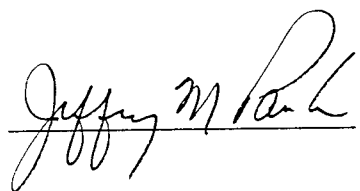
COMBAT SALVAGE PLANNING FOR THE OPERATIONAL COMMANDER

by

Jeffrey M. Pauls
LCDR USN

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Operations Department.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: 

22 June 1995

Paper directed by Captain D. Watson
Chairman, Joint Military Operations Department

19950417 092

NOV 1995

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED		1b RESTRICTIVE MARKINGS	
2a SECURITY CLASSIFICATION AUTHORITY		3 DISTRIBUTION/AVAILABILITY OF REPORT DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.	
2b DECLASSIFICATION/DOWNGRADING SCHEDULE		5. MONITORING ORGANIZATION REPORT NUMBER(S)	
4 PERFORMING ORGANIZATION REPORT NUMBER(S)		7a. NAME OF MONITORING ORGANIZATION	
6a. NAME OF PERFORMING ORGANIZATION OPERATIONS DEPARTMENT	6b. OFFICE SYMBOL (If applicable) C	7b. ADDRESS (City, State, and ZIP Code)	
6c. ADDRESS (City, State, and ZIP Code) NAVAL WAR COLLEGE NEWPORT, R.I. 02841		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8a. NAME OF FUNDING / SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (If applicable)	10. SOURCE OF FUNDING NUMBERS	
8c. ADDRESS (City, State, and ZIP Code)		PROGRAM ELEMENT NO.	PROJECT NO.
		TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) COMBAT SALVAGE PLANNING FOR THE OPERATIONAL COMMANDER (U)			
12. PERSONAL AUTHOR(S) LCDR JEFFREY M. PAULS, USN			
13a. TYPE OF REPORT FINAL	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 2/13/95	15. PAGE COUNT 23
16. SUPPLEMENTARY NOTATION A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.			
17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	
		SALVAGE; TOWING; HARBOR CLEARANCE, SEARCH AND RECOVERY; DEBEACHING; AMPHIBIOUS OPERATIONS; BATTLE DAMAGE REPAIR	
19. ABSTRACT (Continue on reverse if necessary and identify by block number) Current operational planning does not incorporate the use of combat salvage for wartime operations. Historically, Task Force Commanders, both Naval and Joint, have lacked support in the salvage mission area. Given the present naval assets and capabilities, operational commanders must realize that combat salvage is an additional weapon which, when properly utilized, allows the commander maximum efficiency of force. Probable scenarios for Naval Presence and Crisis Response operations make salvage missions increasingly likely and important. Today's Naval Component Commander must be able to understand the complexity of the planning and the organization required to conduct these salvage missions in modern operational environments. To achieve this end, there needs to be a modification in staff organization and, operational planning methodology, naval planning publications changes, to include doctrinal publications, and salvage asset assignment within task groups.			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL CHAIRMAN, OPERATIONS DEPARTMENT		22b. TELEPHONE (Include Area Code) 841-3414	22c. OFFICE SYMBOL C

Abstract of

COMBAT SALVAGE PLANNING FOR THE OPERATIONAL COMMANDER

Current operational planning does not incorporate the use of combat salvage for wartime operations. Historically, Task Force Commanders, both Naval and Joint, have lacked support in the salvage mission area. Given the present naval assets and capabilities, operational commanders must realize that combat salvage is an additional weapon which, when properly utilized, allows the commander maximum efficiency of force. Probable scenarios for Naval Presence and Crisis Response operations make salvage missions increasingly likely and important. Today's Naval Component Commander must be able to understand the complexity of the planning and the organization required to conduct these salvage missions in modern operational environments. To achieve this end, there needs to be a modification in staff organization and, operational planning methodology, naval planning publications changes, to include doctrinal publications, and salvage asset assignment within task groups.

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution	
Availability Codes	
Dist	Avail and/or Special
A-1	

INTRODUCTION

If the Gulf War salvage experience can be summed up into one all-encompassing lesson learned, it is that salvage must be integrated into mobilization planning and execution, and included in the deliberate planning for crisis response, limited regional conflict or major wartime engagements... Although Persian Gulf Naval operations took place in a relatively benign environment, major naval casualties were sustained. Salvage assets to deal with these casualties were barely adequate and arrived in-theater "just in time". Any significant naval action would have overwhelmed available salvage resources...Major challenges ahead are to educate planners in salvage mission responsibilities and capabilities, and to aggressively promote integration of salvage considerations into Navy and joint concepts of operations and operation plans.¹

As the Navy sails FORWARD...From The Sea, "away from having to deal with a global maritime threat and toward projecting power and influence across the seas in response to regional challenges,"² it stands to reason that as our ships operate more in the littoral environment there will be a greater likelihood for catastrophic situations that will require combat salvage. Throughout the Cold War, especially since the end of the Vietnam War, the U.S. Navy has increasingly failed to understand the importance of the role combat salvage forces play in naval operations. Comprehensive planning at the Naval Component Commander level will ensure that adequate force levels, plans, and logistics considerations are addressed before they become a crisis. As the operation develops, resources can begin moving by priority and plans can be executed. Prior planning

will allow the Task Force Commander to concentrate on the tactical situation vice trying to develop basic salvage plans which may require reassignment of valuable combatants from their primary function to accomplish unforeseen emergencies, which could have been accomplished utilizing salvage ships.

It is irrefutable that as long as the Navy operates at sea, whether in peacetime or during conflict, damage to ships will occur. This alone should create the necessity for combat salvage force consideration in Operation Planning (OPLANS).

This paper begins with a description of the demands for salvage as they pertain to the Naval Component Commander. Combat salvage planning will be followed by a historical perspective of the employment of salvage forces from World War I through Operation Desert Storm. Finally, the conclusion, followed by recommendations for future operational planning considerations for combat salvage forces.

DEMANDS FOR COMBAT SALVAGE

To effectively plan a salvage mission, as with other warfare areas, threat analysis must be conducted. This analysis cannot be generic in nature due to the uniqueness of each salvage mission. The mission (Amphibious Support, SLOC Clearance, Battle Damage Repair, Search and Recovery, and Harbor Clearance) will determine the type, quantity and placement of assets. The Task Force Commander must be made aware of the capabilities of his salvage assets, the risks involved (expected intensity of battle, weather, prolonged operations, inadequate charts and lack of logistical support) and be given reasonable estimations of the mission's success if he is to make sound decisions pertaining to each mission. This can only be accomplished if the staff has knowledgeable salvors assigned. Each combat salvage mission area is unique and has its own associated risks.

Amphibious Support requires rescue towing, underwater ship's husbandry (welding, propeller changes, hull inspections), debeaching and battle damage repair. Historically, an amphibious assault has required extensive debeaching and salvage assets. It can be argued that these assets can be somewhat reduced due to the use of modern landing craft air cushioned vehicles (LCAC) and helicopters. Conversely, the increased size and value of amphibious ships may require prepositioned salvage ships and associated salvage assets in the event of an incident.

As all salvage missions are time critical, none are as critical as debeaching. Due to the inherent dangers operating in close proximity to shore, timeliness of response can mean the difference between minor casualties and total loss in a beaching situation. In planning for amphibious operations, thought should be given to positioning and coordination of salvage forces (U.S. Navy Seabees and U.S. Army Transportation Corps are included in amphibious operations salvage forces). This is especially critical if the assault is opposed by an enemy. To be effective during an opposed landing the salvage forces should be integrated into the Amphibious Task Force.

SLOC Clearance requires rescue towing, underwater ship's husbandry, and debeaching capabilities appropriately positioned along the SLOC. The most common requirement for the salvage ship in SLOC Clearance is towing due to either combat casualties or marine breakdown. Towing of disabled ships can be accomplished by either salvage ships or civilian ocean tugs. Normally the greatest concentration of ships and danger of enemy action will be at the termination point of the SLOC. This is where the most capable salvage assets should be positioned.

Battle Damage Repair requires rescue towing, underwater ship's husbandry, off-ship firefighting assistance and repair party augmentation, and computer assisted Battle Damage Assessment Teams (BDAT). The primary purpose of the battle damage repair organization is to assist the damaged vessel's crew in extinguishing fires and containment of flooding onboard the ship.

Once stabilized, the casualty can be moved to a repair facility. The BDAT, described in NWP 62-1 (Rev-C), is a detachment which, while it may assist in damage control, is primarily concerned with assessment of the damage and pre-planning repairs. The BDAT normally originates from a tender in-theater and may be augmented by a salvage engineer with a portable computer programmed to assess structural strength and ship stability.

In missile threat environments emphasis should be placed on off-ship firefighting capabilities. In a mine threat environment, a diving capability is essential to survey any hull damage which could be inflicted by a mine detonation. U.S. Navy salvage ships offer excellent off-ship firefighting and diving capabilities along with being an ideal command and control platform for the salvage operation.

Search and Recovery requires deep-sea diving and/or remote operated vehicle (ROV) capabilities, searching sonar capability, and lifting and transport capability. Assets required will depend on the depth and size of the object, current, weather and how quickly the object needs to be recovered. Since numerous contingencies can exist for a recovery mission it is not realistic to have all the assets prepositioned in-theater to accomplish search and recovery. It is possible for an operational commander to consider the most likely search and recovery missions (aircraft and missile recovery for failure analysis or other material for intelligence exploitation) and plan his assets accordingly.

Harbor Clearance requires in-harbor towing, surface-supplied diving, underwater cutting and welding, ship raising, and the use

of heavy lift craft and large cranes. Joint planning is critical in coordinating Army, Navy Seabee and Naval afloat and ashore salvage assets. Due to the lack of U.S. Navy heavy lift craft, contracted civilian lift craft may be required. Prior to utilization of a captured enemy port, the operational commander will have to consider if clearance will be required for the port to be operational and position his assets accordingly to accomplish the task. Historically, enemies have attempted to block essential channels and pier spaces by mining and the deliberate scuttling of ships. If this should occur, a major effort by Army, Navy and possibly Allied forces may be necessary to restore the channel or harbor to operation.

COMBAT SALVAGE PLANNING

"The theater commander has to be concerned with maintaining the momentum of any combat operation by seizing the initiative and sustaining the drive. This is particularly true of a littoral operation in which an amphibious landing is planned in order to gain a lodgment from which penetrating drives can emanate. The sustainment effort of a littoral engagement quickly bridges the combat area to the secure, rear areas from where supplies originate."³

The operational commander must realize that there exists a possibility of damage to one or more of his combatants within a combat area, and the same possibility exists for damage to non-combatants in either the combat area or while transiting through a SLOC. Because of this constant possibility of damage the task force commander should have a plan for this contingency. This plan should allow for the deployment of salvage forces in the theater of operations, along the SLOC, ready to assist as necessary. A plan for such an operation sounds like a fairly easy task, but it is more complicated than just requesting a few Navy tugs to escort a few tankers.

Original tasking of the salvage forces begins with the *Joint Strategic Capabilities Plan* (JSCP), where combatant commanders are apportioned major combatant forces. The JSCP further directs the combatant commander to prepare a specific OPLAN and develop specific Concept of Operations (CONOPS) for particular contingencies. The combatant commander takes his direction from

the JSCP and enters into the Joint Operation Planning and Execution System (JOPEs), where the OPLAN is formulated. A critical aspect in developing an OPLAN is the formulation of the time-phased requirements as they pertain to the deployment of forces and equipment.⁴ This formulation is called the Time Phased Force Deployment and Data (TPFDD), which is crucial to insuring the campaign develops properly.

Up to this point in the planning process there has not been any mention of combat salvage as it pertains to the overall OPLAN. The next step in the planning chain is with the component commanders. Since combat salvage forces are not combatants they fall into the category of combat support (CS) forces which report under the service component commander. The Navy component commander is responsible to the supported commander for the development of the salvage concept of operations and insuring it is integrated into the OPLAN as an annex, normally under logistics. It is through this annex that combat salvage force logistics are placed into the TPFDD and these assets and equipment required by the combat salvors are either air or sea lifted to the area of operation. Currently, there are no assigned salvage officers on the Naval component commander's staffs. A major concern here is that by not having a knowledgeable salvage officer on the component commander's staff, the required logistics will not be entered and updated in the OPLAN annex. This omission causes high priority salvage and towing support items to become secondary considerations for transportation into the area of operation. The overall effect is that the naval component commander does not have a fully

functional salvage force at his disposal. Historical analysis of past wars shows that there will always be a need for salvage assets and, when required for an emergency, they will be needed immediately. Detailed planning is the key to ensuring salvage assets will be onhand when they are required.

COMBAT SALVAGE HISTORY

As far back as the late nineteenth century the Navy has utilized marine salvage, but not until World War I was there a permanent Navy salvage organization. Prior to World War I the raising of the sunken submarine F-4, from 51 fathoms of sea water, was the most notable salvage operation the Navy had undertaken.⁵ F-4 sank from unknown causes and it was the job of these early salvors to raise her and determine the cause of the sinking. The submarine was refloated and the cause of her sinking was determined to be corrosion of the rivets in the pressure hull. Though F-4 was successfully raised from the bottom of the ocean she was declared beyond economic repair and was struck from the Navy's list of ships. The efforts to determine the cause of the F-4 sinking lead to the development of submarine salvage and deep diving techniques.⁶

United States' entry into World War I forced the Navy to develop a salvage organization that could provide respond to ship breakdowns and groundings to help keep open sea lines of communication. The economics of the salvage business in the twentieth century had left the United States with three major salvage companies who all maintained ships and facilities along the Atlantic coast. With the entry of the U.S. into the war, a salvage corps was founded under the direction of the Chief Constructor, the head of the Navy's Construction Corps. The diving school in Newport, RI was disbanded so that its men, along with civilian salvage masters could be sent to France to assist with salvage

operations there. These forces joined British, French, and Italian salvors to form an allied salvage force.⁷

In 1917 the British made an urgent request to the U.S. Navy for salvage assistance to help refloat grounded ships off the French coast. The U.S. Navy had no salvage ships of their own, so the British request was passed by the Chief Constructor to the three U.S. salvage companies who all felt the risks in providing services to the British were not justified. They all refused the request to provide their services. The Navy then confiscated the salvage ships and put the experienced salvors who ran the ships in the Navy as reservists in order to meet the allied request for support.⁸

While the surface forces were struggling with their contract support salvors the submarine forces developed the expertise to become the best in the world in submarine rescue, salvage, and helium-oxygen deep sea diving techniques. Of eight non-combat submarines sinkings between World Wars I and II, seven were raised. The deeper depths of salvage operations drove the development of mixed gas deep-sea diving. The inability of early salvage attempts to rescue trapped survivors resulted in development of Submarine Rescue Vessels (ASR's) and the McCann Rescue Chamber (a surface tethered, one atmosphere, manned diving bell that mated to the submarine over a specially configured hatch).⁹ These efforts were generally contained within the Construction Corps engineers and the submarine communities, but were the nucleus from which our World War II salvage forces would grow.

At the onset of World War II the Navy realized that it did not have the capability to cover all the SLOCs as well as the eventual forward combat areas with existing assets. The Navy began a massive salvage ship-building program in which 69 large fleet tugs (ATF's), 29 rescue salvage (ARS's), 4 lift craft (ARS/D's), 3 mobile support base ships (ARS/T's), 11 mixed-gas diving and submarine rescue vessels (ASR's), and numerous landing craft configured for salvage work were built.¹⁰

As the war progressed in Europe so did combat salvage. The following are examples of how combat salvage was integrated into the operational objectives of the theater commanders: Operation Torch was the first major amphibious operation conducted by the allies. Salvage was not of primary interest to the operation planners as indicated by the assignment of only one ATF to the invasion force assaulting Morocco. USS *LEEDSTOWN* (AP 73) was hit by a series of torpedoes and sank while waiting for a salvage ship to render assistance. In another incident an amphibious ship, USS *THOMAS STONE* (APA 29) struck a mine and offloaded half of her landing force (741 of the 1400 soldiers onboard) in landing craft which then transited 160 miles to Algiers. The *Stone* was later towed to Algiers by two British destroyers. In a third incident a violent storm on the North African coast caused over half of the landing craft (169 of 330) to be wrecked on the beach which in turn hampered over the beach movement of men and equipment. This situation came about from insufficient attention to landing-craft salvage and the absence of dedicated, trained, and equipped salvage teams.¹¹ The first major amphibious operation did not go well from

a salvage standpoint, mainly because forces were not adequately planned for. For the Allies, "...the lesson had been learned: Naval forces of all kinds in combat areas must be supported by effective salvage forces to prevent unnecessary losses. Future transits had salvage protection."¹²

Another critical concept of operations for World War II salvors revolved around harbor clearance and port restoration. The North African ports of Oran and Casablanca posed significant problems for salvage forces. Both harbors contained damaged and sunken drydocks that were necessary for docking damaged ships. Also, both harbors contained numerous wrecks that blocked harbor entrances or berths within the ports. Thirteen wrecked ships were removed or salvaged from Casablanca which included five large cargo or passenger ships, the French battleship *Jean Bart*, a French destroyer, and two floating drydocks.¹³ In Oran, the principle Salvage officer for the Mediterranean, Captain Ellsberg, described the port as follows:

"There were twenty-seven French wrecks littering the harbor. Masts and stacks at crazy angles broke the surface...wherever one's eyes lighted--in most cases, the hulls, whether right side up, upside down, or on their sides, were wholly submerged and invisible. A string of masts and smokestacks lay across the entrance to the inner harbor. There six ships, anchored in two lines nearly bow to stern, had been scuttled to block the port. Inside there were sunken destroyers, sunken submarines, sunken freighters, sunken passenger ships, sunken drydocks. Everything in the port had been scuttled before the surrender--across the entrance, in the fairways, alongside the quays--wherever in the opinion of the French Commandant at Oran they would cause us the most trouble in reopening the port."¹⁴

It is not difficult to imagine the scope of work that was required to restore Oran to an operational harbor. By clearing prioritized wrecks the harbor was quickly made usable allowing the flow of logistics to continue while less urgent wrecks could be refloated and moved.

In the Pacific, combat salvors were hard at work from Pearl Harbor to the Philippines. With the exception of Pearl Harbor combat salvors were more concerned with rendering assistance to damaged ships than with harbor clearance. The basic concept of operations in the Pacific had the fleet tugs assisting damaged ships in the forward battle areas, then towing them from the combat areas to the safer rear area. There, the damaged war ships could be repaired and placed back in action. In the Philippines, operations were similar to those of the amphibious operations in Europe. Combat salvage ships closely supported amphibious forces and provided assistance whenever needed.

Vietnam saw a resurgence in the harbor clearance aspect of the concept of operations. With little opposition to amphibious operations salvage vessels saw limited action as compared to the Pacific campaign during World War II. Early in the Vietnam War attention focused on harbor clearance when the USNS *Card* (T-AKU 40) was mined, blocking Saigon Harbor. In less than three weeks *Card* was raised and towed to Subic Bay in the Philippines.¹⁵ Operational problems encountered with the *Card* salvage revealed a need for a different type of salvage organization which lead to the development of the Harbor Clearance Units (HCU's). Operating from mobile support platforms, the HCU's were outfitted and staffed to

provide rapid response to salvage problems. Additionally there was a need for more specialized salvage assets, and two heavy lift craft and several light lift craft were returned to service and assigned to the HCU. Teams from the HCU kept the Mekong Delta waterways clear by removing large numbers of sunken boats and craft, barges, and aircraft, plus a few sunken or grounded ships. The HCU also provided fly-away teams for rapid salvage response throughout Southeast Asia as well as battle damage and recovery operations. This concept proved to be extremely successful and cost effective.¹⁶

When Iraq invaded Kuwait in August 1990, no Navy salvage ship, salvage equipment, or land-based salvors were in that theater of operations, nor had any been requested. Moreover, because salvage did not appear in any operations plan and there was no salvage officer on the staff of the Commander, Naval Forces, Central Command (COMUSNAVCENT), no assets had been programmed to be sent to the region.¹⁷

The absence of salvors on the major staffs was reflected in the near total absence of plans for employment of salvage forces during Operation Desert Shield and Desert Storm. During the massive force buildup no salvage ship, shore based (MDSU) salvors, or salvage equipment was requested by the naval component commander. Since salvage requirements were not spelled out, or were out dated, and no salvage officer was assigned to the USNAVCENT staff, no programmed TPFDD file existed for salvage assets. Only by the last minute efforts of NAVSEA (Supervisor of Salvage office) and OPNAV (OP-03) staffs was an ad-hoc salvage organization and assets provided in-theater.¹⁸ In-theater assets

included the Dutch ocean going tugs-SMIT TAC New York and *Madura* and 300 tons of portable Emergency Ship Salvage Equipment. One Navy salvage ship, *USS BEAUFORT* (ATS-2), and four salvage officers were in place before the war ended. Fortunately this limited force was able to provide immediate salvage assistance to *USS TRIPOLI* and *USS PRINCETON* during their mine hits in February 1991. The prompt assistance, inspection, and technical advice provided to *PRINCETON* may have saved her from breaking up. Contrasted with the early January 1991 grounding of *USNS ANDREW J. HIGGINS*, which remained aground for three days awaiting the assistance of a salvage engineer and divers, the assistance to *PRINCETON* was immediate and removed her from harms way so that she could be repaired to fight another day.¹⁹ Fortunately for the United States, salvage forces arrived in-theater in time. Had the Iraqi's been a more formidable adversary, or had the anticipated amphibious landing occurred, the salvage assets in the Persian Gulf would not have been sufficient.

CONCLUSIONS

Historical accounts of past wars show a definite need for combat salvage forces in-theater prior to a crisis occurring. As Navy strategy changes toward a littoral focus, our ships will be operation more frequently close to shore and in the SLOCs. The combat and non-combat salvage and towing demands of Desert Shield/Desert Storm are indicative of what the Navy might expect in future low intensity regional conflicts.²⁰ The operational planner (the naval component commander and his staff) has to incorporate a combat salvage concept into his OPLAN and routinely update the TPFDD to ensure the desired forces and equipment are on hand when they are needed. Unfortunately for the Navy there are no experienced salvage officers assigned or billeted to these staffs. Captain Fiske, Supervisor of Salvage and Diving, at the Naval Sea Systems Command, stated the combat salvage concept succinctly:

Salvage has tremendous operational impact, whether in keeping lanes clear during an amphibious landing, in preserving scarce, high-value ships, or in clearing harbors for access. As with most logistics functions, the leverage is in preparation and planning. Identifying the need in the midst of conflict is too late. The ship damage sustained during the Gulf War, despite our having been dominant at sea, demonstrates that salvage must be an integral part of our warfighting planning, and salvage assets must be identified and in place when operations begin.²¹

RECOMMENDATIONS

First, provide Task Force, Numbered Fleet and Major Component Commander's staffs an experienced operational salvage officer in the operations and planning area. These salvage officers must have input into and participate in the planning process.

Second, conduct a thorough review of Joint Doctrine publications concerning amphibious and logistics operations to ensure combat salvage forces are included to allow support to the operational commander. As stated before, we know when ships put to sea, whether in combat or peacetime, they will sustain damage. The assets should be available, as they become required, to assist the damaged ship and move it out of harms way. Identifying the need during the conflict is too late.

Third, establish a Force Salvage Coordinator (FSC) on the Naval Component Commander's staff (CINCLANTFLT and CINCPACFLT). The FSC would advise the component commander on all salvage related missions and give recommendations on force employment. The FSC could also ensure salvage forces operating in theater would have a point of contact on the component commander's staff that could expedite logistic matters and ensure operational decisions are made in a more timely manner.

By implementing the above recommendations the Navy will be able to better utilize a valuable tool within the fleet and reduce crisis management during times of conflict. *Plan the Dive, Dive the Plan.*

Notes

¹Commander, Naval Sea Systems Command, Operation Desert Shield/Desert Storm Salvage, Vol. I Interview Report, (July 1991) Forward

²Department of the Navy. Forward...From The Sea. Washington DC. 1994. p.1.

³P.N. Bruno, "Combat Salvage in the Littoral Environment," Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1993, p.5

⁴Joint Staff. Joint pub 5-03.1, Joint Operation Planning and Execution System Volume I (Planning Policies and Procedures). Washington DC: 4 August, 1993. p. III-13.

⁵C.A. Bartholomew, Mud, Muscle, and Miracles, Marine Salvage in the United States Navy, Washington: Department of the Navy, 1990, p.10.

⁶Ibid., p.13

⁷Ibid., p.17.

⁸Ibid., p.18.

⁹J.M. Evans, "U.S. Navy Special Operations Community--Diving and Salvage Functional Area," Unpublished Research Paper, The Industrial College of the Armed Forces, Fort McNair, Washington DC: 1993. p.5.

¹⁰Bartholomew, p. 87.

¹¹Ibid., p.101.

¹²Ibid., p.103.

¹³Ibid., p.110.

¹⁴Ibid., p.113.

¹⁵Ibid., p.247.

¹⁶Ibid., p.262.

¹⁷K.L. Skudin, "Salvage Support and Operational Commanders-What They Need But May Not Get," Naval War College Review, Naval War College, Newport, RI: Autumn 1994. p.18.

¹⁸Evans, p.10.

¹⁹Skudin, p.19.

²⁰Naval Sea Systems Command, Desert Storm, Vol.1, p.7-1.

²¹R.P. Fiske, "Salvage in Combat," U.S. Naval Institute Proceedings, September 1992, p.69.

BIBLIOGRAPHY

- Bartholomew, C.A.. Mud, Muscles and Miracles, Marine Salvage in the United States Navy. Washington D.C.: Department of the Navy, 1990.
- Bruno, P.N.. "Combat Salvage in the Littoral Environment," Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1993.
- Department of the Navy. Forward... From The Sea. Washington DC. 1994.
- Evans, J.M.. "U.S. Navy Special Operations Community--Diving and Salvage Functional Area," Unpublished Research Paper, The Industrial College of the Armed Forces, Fort McNair, Washington DC: 1993.
- Fiske, R.P.. "Salvage in Combat," U.S. Naval Institute Proceedings, September, 1992.
- Joint Staff. Joint Pub 5-03.1, Joint Operation Planning and Execution System Volume 1 (Planning Policies and Procedures). Washington DC: 1993.
- Naval Sea Systems Command. Operation Desert Shield/Desert Storm Salvage Report, Volume 1. T0800-AE-RPT-010/SUPSALV. Washington: July 1992.
- Operation Desert Shield/Desert Storm Salvage Report, Volume 2. T0800-AE-RPT-020/SUPSALV. Washington: July 1992.
- Salvage 2010, Naval Force Level Requirements for Salvage Ships. Washington: April 1991.
- U.S. Navy Salvage Manual Volume 2 (Harbor Clearance). S0300-A6-MAN-020. Washington: 1 August 1991.
- Morison, S.E.. The Two-Ocean War. New York: Little, Brown, 1963.
- Skudin, K.L.. "Salvage Support and Organizational Commanders-What They Need But May Not Get," Naval War College Review, Naval War College, Newport, RI: Autumn 1994.

U.S. Navy Department. Naval Operational Planning. NWP 11 (Rev F). Washington, D.C.: September 1991.

U.S. Navy Department. Surface Ship Survivability, NWP 62-1 (Rev C). Washington, D.C.: December 1989.